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THE JOURNAL OF PHILOSOPHY

ON THE NATURE OF DIMENSION

THE following paper aims to offer a complete analysis of the conception of dimension. It continues and ends an inquiry printed in *Mind* (Vol. I, N.S. No. 4) under the title "On the Properties of a One-dimensional Manifold," by adding to the notion treated in that paper, and here called "simple" dimension, another, here called "compound" dimension.[1] It appears from both papers that these two notions are the only possible varieties of the conception of dimension.

I. COMPOUND DIMENSION

A relation implies a duality, of which the members are termed "relates," and said to "subsist" in the relation. In comparing, or

[1] The publication of this earlier paper shared in a coincidence worthy of record even after so many years. Shortly after its appearance in *Mind* for October, 1892, I received from the late Professor G. Vailati of Crema, Italy, a copy of the *Rivista di Matematica* for May and June of that year, containing an article by himself dated March, 1892, entitled "Sui Principi Fondamentali della Geometria della Retta," in which these principles were reduced to the identical pair which I had reached in my essay, at that date in the keeping of *Mind*. Only the symbolism and mode of statement differed. As I had rejected various equivalent groups of ideas in writing my paper, its final agreement with Professor Vailati seemed remarkable. It seemed all the more remarkable because I had approached the subject from the study of music, and Professor Vailati from that of mathematics. I had found reason to question the analysis of the form of the sensation of tone given in the *Tonpsychologie* of Professor C. Stumpf, and Professor Vailati had sought to simplify the analysis of spatial form given in Professor G. Peano's *Principi di Geometria*.

The "irreducible characteristic properties of one-dimensional space" reached by Professor Vailati may be stated in the language of the present paper as follows:

1. No element bears to any other both aspects of a given relation.
2. Every element bears to every other one or other aspect.
3. The aspects are transitive.

The "ultimate constituents of the notion of one-dimensionality" reached in my paper are the same, the first two being stated as one.

If Professor Vailati's phrase be understood to mean that the propositions he assumed exhaust the idea of one-dimensional space, and if mine be understood to mean that my two equivalent propositions exhaust the idea of one-dimensionality in general, both now appear unjustified. For one of these propositions denies the alternative recognized in the following paper as determining the compound type of one-dimensional manifold, logically conceivable as illustrated by the right line in space.

apprehending the relation of, any two relates, *A* and *B*, either may be regarded from the "standpoint," as we say, of the other. In speaking of the two impressions received in the two cases, they may be distinguished by calling one—for example, the impression received when *B* is regarded from the standpoint of *A*—the "direct aspect" of their relation; and the other—in this case the impression received in regarding *A* from the standpoint of *B*—the "converse aspect." An aspect is said to be "borne" by the relate taken as standpoint to the relate taken as *point de mire*.

The aspects of a relation may be the same impression or different impressions. When the two impressions are the same, the relation may be called "homogeneous." A homogeneous relation is usually spoken of as "its own converse." The relation "equality" is an example. If one thing is equal to another, the other is also equal to the first. When the two impressions differ, the relation may be called "heterogeneous." The relation implied in analysis and synthesis is an example. The impression received in viewing a part from the standpoint of the whole differs from the impression received in viewing the whole from the standpoint of a part.

A relation may be "transitive" or "intransitive." It is transitive when the following inference can be drawn regarding three relates which illustrate it. If a first relate, when compared with a second, be found to bear the direct, or the converse, aspect thereto, and the second when compared with a third be found to bear the same aspect thereto, the first will be found to bear the same aspect also to the third. The relation "significance" is an example. If a first circumstance be the sign of a second, and the second the sign of a third, it follows that the first is also the sign of the third. A relation is intransitive if this inference can not be drawn. The relation "friendship" is an example. If a first person be friend to a second, and the second friend to a third, it does not follow that the first is also friend to the third.

Thus in the instance of a transitive relation there are two ways of finding the aspect borne by one relate to another. The two may be compared with each other, or each may be compared with a third element with which they subsist in the same relation. The second way is that of inference, and the first may be called that of inspection.

A manifold is any plurality of things. These may be called the "elements" of the manifold.

A manifold may be such that every pair of its elements subsists in one certain relation. The relation may then be termed "characteristic" of the manifold. When a characteristic relation is both heterogenous and transitive, it is called a "dimension" of the mani-

fold it characterizes. Let such a manifold be called a *one-dimensional* manifold.

Any group of elements, taken from a one-dimensional manifold, itself forms a one-dimensional manifold, and consists of a certain natural number of elements. The process of taking elements consists in taking a first element, then a second, then a third, and so on, a certain natural number being reached when all of the group have been taken.

A one-dimensional manifold may be such that whatever the conditions under which the aspect of any element E to any other element E' is sought, the aspect found will be the same, whether direct or converse. Or, a one-dimensional manifold may be such that under alternative conditions opposite aspects of E to E' will be found. Every one-dimensional manifold is of one or other of these two types. For in any such manifold every element will be found to bear to any other either the direct or the converse aspect of their relation; and hence under any conditions in which it is not found to bear the direct aspect it will be found to bear the converse aspect, and *vice versa*. The two types may be called respectively "consentient" and "dissentient."

The earlier paper already referred to considered the case of consentient manifolds only. In such manifolds no element bears both the direct and the converse aspect to any other; that is to say, under all conditions, or upon all occasions, when the aspect of any element E to any other element E' is sought, the aspect found will be the same, whether direct or converse.

In considering consentient manifolds, the following definitions were adopted in that paper. Any element found to bear the direct aspect to one of a pair of other elements, and the converse aspect to the other of the pair, was spoken of as "between" the two. Any element found to bear the direct aspect, or the converse aspect, to both was spoken of as "beyond" the two, and as directly beyond or conversely beyond. Any elements between which none can be found were spoken of as "adjacent" in the manifold.

Using these definitions the following propositions were shown to be true of any group of elements taken from a one-dimensional manifold of the consentient type. Every element in the group, excepting two different elements, has two adjacents, one to which it bears the direct aspect, and another to which it bears the converse aspect. One of the two different elements excepted bears the direct aspect to all others of the group, and hence has a direct adjacent only and no converse adjacent. The other of the two excepted bears the converse aspect to all others of the group and hence has a converse adjacent only and no direct adjacent. These two different elements

were called the "extremes" or "ends" of the group, and respectively its direct and its converse ends. The remaining elements were spoken of as "intermediate" to these, or "the intermediates" of the group. Each intermediate bears the direct aspect to one adjacent and the converse aspect to one other; and by inference bears either one aspect or the opposite to all the other members of the group, or one aspect to some of them and the opposite aspect to the rest. Thus, any intermediate element N divides a consentient group into two consentient parts, either a group and a pair, or two groups, the direct end of the group being the direct, and N the converse, end of one part, and N being the direct and the converse end of the group being the converse end of the other.

The present paper treats also of the other possible type of one-dimensional manifold, namely, the dissentient type. In such manifolds every element bears both the direct and the converse aspect of their relation to every other; that is to say, under certain conditions, or upon some occasions, in which the aspect of any element E to any other element E' is sought, the aspect found will be direct, while under alternative conditions, or upon the remaining occasions, it will be found to be converse.

Every group of elements taken from a dissentient manifold itself forms a dissentient manifold and consists of a certain natural number of elements. It proves that any such group may be analyzed at any pair of its elements into two consentient groups, joined contrariwise by their extremes forming the pair. Otherwise stated, every pair of elements of a dissentient group divide it into two consentient groups, one of the pair being at once the direct end of one of these groups and the converse end of the second; and the other one of the pair being at once the converse end of the first group and the direct end of the second. For any element in such a group bears the direct aspect to any other and constitutes therewith either without or with intermediates, a consentient group of which it is the direct end and the other the converse end. The same element bears also the converse aspect to that other, and constitutes therewith either without or with intermediates, a consentient group of which it is the converse end and the other the direct end. Further, all the other elements of the group are intermediates of these two. For if any of them did not bear the direct aspect to one of the pair and the converse aspect to the other, it would not bear both aspects to every other and the group would not be dissentient. Hence every dissentient group may be analyzed at any pair of elements into two consentient groups joined contrariwise by their extremes forming the pair.

The alternative conditions under which any element E of a dis-

sentient manifold is found to bear opposite aspects to any other E' thus prove to be those presented by the two consentient groups into which the dissentient whole is analyzed by the pair. According as regard is had to one or other of the two groups by which E and E' are related, the aspect of either element to the other is found direct or converse.

The relation of the two component groups to one another is a new relation, differing from that characterizing the groups in common. Otherwise stated, the relation of the conditions under which any element E will be found to bear the direct aspect to any other E', to the conditions under which E will be found to bear the converse aspect to E', differs from the relation whose aspects are sought under the conditions named. The dissentient type of one-dimensional manifold may accordingly be spoken of as one of "compound dimension."

In the instance of a consentient manifold no new relation enters into the determination of the aspect of any element E to any other E', but only inspection of or inference by the characteristic relation of the manifold. A consentient one-dimensional manifold may accordingly be spoken of as one of "simple dimension."

Any group taken from a dissentient manifold, or manifold of compound dimension, is endless. Each of any pair of elements by which a dissentient group is analyzed into two consentient groups, has a direct adjacent in one and a converse adjacent in the other; and all the other elements of the group, being intermediates to these two, have likewise two adjacents, each in its own group. Hence all of the elements of a dissentient group have two adjacents; and since an end has but one, none is an end.

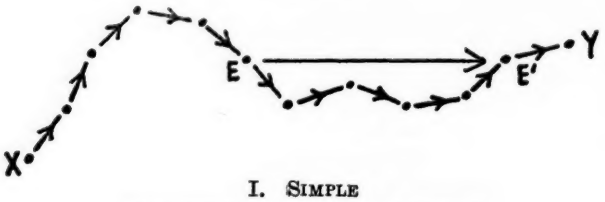
Since in any group of elements taken from a consentient manifold, or manifold of simple dimension, the two ends are different elements, the group may be spoken of as "divergent."

On the other hand, in a dissentient group, since any element E may be found to bear the direct aspect to any other E' by exclusive regard to one of the two consentient groups into which the pair divide the dissentient whole; and E' in turn to bear also the direct aspect to E, by similarly regarding the other component group, it follows from the transitivity of their relation that E bears the direct aspect to itself; and by like reasoning the converse aspect also. Hence every element in a dissentient group bears to itself the direct and also the converse aspect. This seems absurd, for the conception of aspect implies two things and not one. There is, nevertheless, duality here involved. The process of inference takes time, and in the conclusion the two terms mean one element considered earlier and later; or in the relation called *identity*. The relates, though oc-

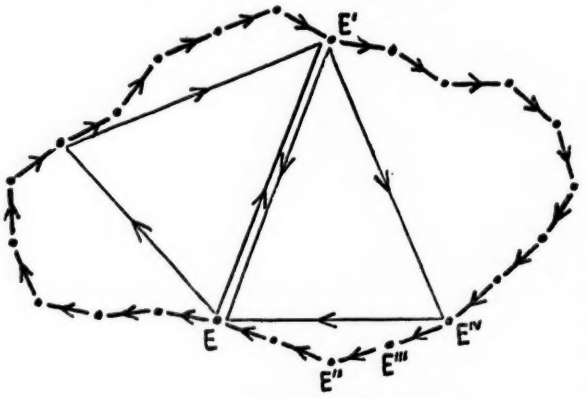
curring earlier and later, do not differ otherwise. Any group possessing this characteristic, namely, that every element bears to itself both the direct and the converse aspect of a characteristic relation, may be spoken of as "reëntrant." Every dissentient group, or group of compound dimension, is therefore reëntrant.

In sum, any group taken from a consentient manifold is also of simple dimension and divergent. Any group taken from a dissentient manifold is also of compound dimension and reëntrant.

The two forms of one-dimensional group are represented in the following diagrams. The arrow indicates that the element from which it points is found to bear the direct aspect to the element to which it points, and the lighter arrows indicate inferences. X is the direct end, Y the converse end of the consentient group. By definition the aspects of adjacent elements must be found by inspection. All other elements are beyond adjacents.



I. SIMPLE
CONSENTIENT DIVERGENT



II. COMPOUND
DISSENTIENT REËNTRANT

When used of the elements of reëntrant groups, the terms "between" and "beyond" become terms of double reference. Any element is between or beyond any pair of other elements according as one or other of the two parts is regarded into which the pair divides the group. For any two elements E and E' being given, any third, E^{IV}, may be taken from either of the two parts into which E and E' divide the group. To E, in the diagram, E^{IV} bears the direct, and to E' the

converse, aspect. It is thus between E and E'. Since E is the direct end of the other part, it bears the direct aspect to E', and hence by transitivity E^{IV} bears the direct aspect to E'. Thus, E^{IV} bears the direct aspect to both E and E', or is directly beyond the two. Likewise, it is conversely beyond the two. Hence, the terms "between" and "beyond," beside their implication of two other elements, imply one or other of the two parts into which these divide the group, and are thus of double reference.

In like manner the term "adjacent" and a corresponding term, "distant," meaning respectively elements between which none or some exist, become, when used of a reëntrant group, terms of double reference. Since any two elements divide the group into two parts, if in one of the parts there is no element between them, as, for example, there is none between E'' and E''', in the diagram, this part consists of the pair of elements only, and the other part consists of the whole group with the pair as its ends and all the other elements of the group as their intermediates. The two are adjacent or distant according as one or other of the two parts into which they divide the group is regarded. Hence, the two terms "adjacent" and "distant," in referring to elements between those concerned, refer as well to one or other of the two parts into which those concerned divide the group, and are thus of double reference.

A latent harmony between disparate ideas has become patent in this discussion. Since in a one-dimensional group every element must bear to every other either one or both aspects of their relation, all one-dimensional groups are either consentient or dissentient. Since, in the determination of the aspect borne by any element E of a one-dimensional group to any other E', either no other or some other relation is involved than that characteristic of the group, all one-dimensional groups are either of simple or compound dimension. Since either every element or not every element of a one-dimensional group has two adjacents, all one-dimensional groups are either endless and reëntrant or possess ends and are divergent. These principles, notwithstanding their diversity—one dealing with aspects, a second with relations, the third with neighborhood—prove to divide one-dimensional groups into the same two classes. The consentient are simple and divergent. The dissentient are compound and reëntrant. The piquant fact about the groups is that the members between which there is no conflict of argument are they that flee each other: and the members between which conflict arises are they that seek each other.

An official position, such as royalty, illustrates simple dimension. Every pair of English kings, for example, subsists in one certain relation, whose aspects, direct and converse, are those of predecessor

and successor. These aspects are heterogeneous and transitive: that is, predecessor differs from successor, and the predecessor of a predecessor is also predecessor. English royalty thus forms a one-dimensional manifold. Moreover, on every occasion when two kings are compared in their royal relation, each bears the same aspect to the other, whether predecessor or successor. The manifold is thus consentient, and of simple dimension; and any selection of kings, for example, Henry VIII, James II, George III, and Edward VII, forms a divergent group. Henry VIII was predecessor to James II, who was predecessor to George III, who was predecessor to Edward VII, a different person from Henry VIII. These latter two are ends of the selection.

A parallel of latitude illustrates compound dimension. Every pair of places on such a parallel subsists in one certain relation, whose aspects, direct and converse, are called, according as they agree with or oppose the apparent motion of the sun, West and East. These aspects are heterogeneous and transitive: that is, West differs from East, and West of West is also West. The parallel is thus one-dimensional. Of any group of more than two places on a given parallel, for example, the parallel of about 40° north latitude, the following propositions are true.

Let the places be Peking, Bokhara, Constantinople, Madrid, Philadelphia, and Salt Lake City. Such a selection forms a reëntrant group: that is, taking any place, for example, Constantinople, it is East of Madrid, which is East of Philadelphia, which is East of Salt Lake City, which is East of Peking, which is East of Bokhara, which is East of Constantinople again. The aspect "East" being transitive, the inference holds that Constantinople is East of itself. Otherwise stated, Constantinople, taken as the start of an inference, bears to itself, when found the terminus of the inference, the aspect "East": and in like manner on another occasion the aspect "West." The parallel is thus a manifold of compound dimension, reëntrant and dissentient.

Any two places, for example, Constantinople and Peking, divide the group into two parts which are groups of simple dimension, with Constantinople and Peking as their common ends. To every member of one of these parts, including Peking, Constantinople bears the Western aspect; and to every member of the other, also including Peking, Constantinople bears the Eastern aspect. Thus every member of the group bears to every other on different occasions either the Western or the Eastern aspect, according to which of the two parts into which they divide the group is taken as the basis of inference. The relation of the two parts is the new relation compounded, with the dimension whose aspects are West and East, to form the one-dimensional manifold called the parallel.

Any two places being given, for example, Madrid and Peking, a third place may be taken from either of the two parts into which the two divide the group. Taking one from the Asiatic part, for example, Bokhara, it is East of Madrid and West of Peking, and is therefore between the two; but since Madrid is East of Peking when the American part is regarded, Bokhara is also by transitivity East of Peking. Hence, in the Eastern direction Bokhara is beyond both Madrid and Peking. In like manner it is in the Western direction beyond both. Bokhara is therefore either between or beyond Madrid and Peking according as the Asiatic or the American part into which they divide the group is regarded.

Taking any two places, for example, Philadelphia and Madrid, between which there is no place in one of the parts into which they divide the group, in this case the Atlantic part, every other place in the group is between them in the other part, in this case the Pacific part.

Finally, no point on a parallel of latitude is an end of the parallel. For an end being an element to which no other bears one of the aspects of their relation, and since every place on a parallel is both West and East of every other, none of them is an end. A parallel of latitude is endless.

The sensation of tone, though a manifold possessing ends, approximates curiously to the endless type. Any pair of tones an octave apart; that is, whose vibration numbers are as 1 to 2, are so much alike that they are called by the same name in music, and often are mistaken one for the other. Were the two sensations identical, every tone would be at once higher and lower than itself: and every pair of different tones would divide the octave into two parts, which regarded from the standpoint of either sensation would be an upward and a downward part. On different occasions, one tone would be judged higher or lower than the other according as it was fancied to be reached through an upward or downward movement. But since tones and their octaves clearly differ when carefully observed, any group of them forms a divergent series. There is but one way, either upward or downward, in which any tone can be reached from any other; and notwithstanding the bent of the sensation toward the dissentient, reëntrant, and compound type, it is in fact a manifold consentient, divergent and of simple dimension.

II. Infinite Manifolds

If the finite be defined as that which is given (occurs), or taken (is apprehended), the infinite may be defined as that which is more than anything which is given or taken. Accordingly, a manifold is infinite if, whatever group of its elements be taken, a different ele-

ment can always be found. If a different element can not always be found, the manifold is finite. An infinite manifold therefore consists of more than any certain natural number of different elements.

A one-dimensional manifold may be infinite or finite in two ways. It may be possible or impossible, whatever group of its elements be taken, always to find a different element bearing to some of the group the direct aspect of their relation, and to the rest the converse aspect, or, as we may say, lying "among" the group. Or, it may be possible or impossible, whatever group of its elements be taken, always to find a different element lying beyond the group, that is to say, bearing to all of the group the same aspect of their relation, whether direct or converse. In the first case the manifold may be called "infinite internally;" in the second case "infinite externally."

A manifold infinite internally is called *continuous*. A manifold finite internally is called *discrete*.

In a dissentient manifold every element bears to every other both aspects of their relation. Hence any different element found to lie among a group will also be found to lie beyond the group: and *vice versa*. Thus, if it is possible or impossible, whatever group be taken, always to find a different element lying among the group, it will also be possible or impossible to find one lying beyond the group: and *vice versa*. That is to say, if a dissentient manifold is continuous it will also be infinite externally, and *vice versa:* if it is discrete, it will also be finite externally, and *vice versa*. Otherwise stated, a dissentient manifold has no infinity apart from its continuity.

In a consentient manifold, every element bears to every other either the direct or the converse aspect of their relation, and not both. Hence, if any different element be found lying among a group, it will not lie beyond the group, and *vice versa*. Thus, whether it be possible or impossible, whatever group be taken, always to find a different element lying among the group, it may be possible or impossible to find a different element lying beyond the group, and *vice versa*. That is to say, a consentient manifold, whether continuous or discrete, may be either infinite or finite externally; and whether infinite or finite externally, may be either continuous or discrete. Otherwise stated, a consentient manifold may possess infinity apart from its continuity.

Three cases are possible. A consentient manifold, or manifold of simple dimension, whether continuous or discrete, may be externally finite in both aspects; or finite in one and infinite in the other; or infinite in both.

(1) Any one-dimensional manifold of simple dimension, whether discrete or continuous, which is externally finite both directly and conversely, has two and only two ends, one direct and one converse.

For if discrete, the manifold itself is a group which may be taken, and therefore possesses two ends. If continuous, it is by the hypothesis of double external finity, impossible, whatever group of elements be taken, always to find another bearing to all the group the direct aspect, or always to find another bearing to all the converse aspect. Taking any group illustrating this impossibility for the direct aspect, it will contain one and only one element, a, as its direct end. Moreover, no two such groups will have different elements as their direct ends: since one of these elements would bear the direct aspect to the other, and by hypothesis it is impossible to find another element bearing the direct aspect to all of either group. Hence, the direct end a, of any group to all of which no element can be found bearing the direct aspect, will be the direct end of all such groups. Further, since no element can be found bearing the direct aspect to a, and since every element in the manifold bears to every other either the direct or the converse aspect, any other element than a will bear the converse aspect to a. Otherwise stated, a is a direct end, and the only direct end, of the manifold. By a similar argument, an element, ω, different from a, proves to be a converse end, and the only converse end, of the manifold. Thus, every one-dimensional manifold of simple dimension, externally finite both directly and conversely, whether discrete or continuous, has two and only two ends, one direct, the other converse.

A rank of soldiers illustrates a one-dimensional manifold of simple dimension, discrete and finite externally both directly and conversely. The aspects of the relation in which all the pairs of soldiers stand are called *right* and *left*. No soldier stands both to the right and left of any other. The members of some pairs stand next each other; that is, there is no soldier to the right of one member of the pair and the left of the other. One soldier stands to the right of all the others, and a different soldier to the left of all the others, the two being the ends of the rank.

The hues of the spectrum illustrate a one-dimensional manifold of simple dimension, continuous in theory, and finite externally both directly and conversely. Their relation is heterogeneous and transitive, with aspects that may be called violet-ward and red-ward. No hue is both violet-ward and red-ward of any other. It is theoretically possible, whatever pair of hues be taken, always to find another violet-ward of one and red-ward of the other. It is impossible, whatever group of hues be taken, always to find another violet-ward of all or red-ward of all. The spectrum has thus two ends, a violet end, and a red end.

(2) Any one-dimensional manifold of simple dimension, whether discrete or continuous, which is externally finite in one aspect of its

relation and infinite in the other, will have one end, and one only. Let the aspect in which it is finite be called the *direct* aspect. The manifold will then have one direct end, a, and if conversely infinite, it is always possible, whatever group of its elements be taken, to find another element bearing the converse relation to the converse end of the group. Hence such a manifold will contain no element as its converse end.

The natural numbers form a one-dimensional manifold of simple dimension, discrete, finite in one aspect of their relation—namely, less,— and infinite in the other,—namely, greater. No natural number is both greater and less than any other. There is no natural number between any pair differing by one. It is impossible to find any natural number less than the number one, which is therefore an end, and may be called the direct end, a, of the manifold of natural number. It is also always possible to find a number greater than the greatest which may be taken. The manifold of natural number has, therefore, no converse end.

(3) Any one-dimensional manifold of simple dimension, whether discrete or continuous, which is infinite externally both directly and conversely, may in like manner be shown to have no end, whether direct or converse.

It may be argued as follows that Time is a continuous manifold, or continuum, of a single simple dimension.

A memory refers to something spoken of as "that which is remembered," or that which is an occurrence, or happening, or event in "past time." The memory is spoken of as an event in "present time." The relation between a memory and that which is remembered is named from its two aspects as the relation of "earlier than" and "later than." A memory is later than the event remembered; the event remembered earlier than the memory of it. These aspects differ; that is to say, the relation subsisting between a memory and the event remembered is heterogeneous.

Of two memories, it may be conceived that if the event remembered in one were present, the event remembered in the other would be present also. Such events are spoken of as happening "at the same time," or as simultaneous, having no relation in Time other than identity.

Or, of two memories it may be conceived that if the event remembered in one were present, the event remembered in the other would be past. Of two events thus conceived, both are conceived earlier than the present. The relation of the three elements into which Time is thereby divided—namely, the present, a later past, and an earlier past—thus appears a transitive relation. An event earlier than another which is itself earlier than a third, is also earlier than the third.

Time thus appears as a manifold whose elements are presents, or groups of simultaneous events. Moreover, each group is conceived as subsisting in the relation *earlier* or *later than* with every other, whether or no the groups differ otherwise. This relation is therefore characteristic of the manifold of Time. Being heterogeneous and transitive, Time is a one-dimensional manifold.

Again, of two memories in one of which the event remembered is earlier than the other, it does not appear possible that a third event could not be found which should be later than one and earlier than the other. Time thus appears a continuous manifold, or continuum, of a single dimension.

By analogy an event may be inferred which shall bear the same aspect to a present event as the present event bears to a past event. Such an inferential event is spoken of as an event in "future time." Any event inferring to an event in future time is called an "anticipation."

Observed Time thus appears as a one-dimensional continuum of present and past elements, Time inferential adding future elements.

Further, it does not appear possible that a past event could not be found earlier than any past event which might be taken, nor that a future event could not be inferred which should be later than any already inferred. With its inferential addendum Time thus appears an endless one-dimensional continuum.

The question arises whether the endless one-dimensional continuum of which Time consists is consentient, divergent, and of simple dimension, or dissentient, reëntrant and of compound dimension. This is the question whether every element of Time, or group of simultaneous events, is or is not both earlier and later than itself. These elements having no identity apart from the identity of the simultaneous events which compose them, the question applied to Time apart from events therein appears meaningless. The question means to ask whether every group of simultaneous events does or does not recur. The doctrine that it does so recur is the doctrine called Eternal Recurrence. The doctrine that it does not so recur may be called by contrast that of Eternal Mutation. The doctrine of Eternal Recurrence asserts that events in Time form a continuum of a single compound dimension, endless because compound, and externally infinite toward both past and future, because continuous. The doctrine of Eternal Mutation asserts that events in Time form a continuum of a single simple dimension, which conceived as consisting of past and present only has one end, namely, the present, being externally infinite apart from its continuity toward the past; and conceived inferentially also, is endless, being externally infinite toward both past and future.

III. Manifolds of Multiple Dimension

Every element in a manifold whose characteristic relation is a certain dimension may be an element also in one or more manifolds whose characteristic relations are other dimensions. Thus a manifold may be composed of, or analyzable into, manifolds of different dimensions. A dimension may accordingly be defined as one of a number of heterogeneous and transitive relations necessary and sufficient to describe the relation in which every element of a given manifold subsists with every other.

It may be argued as follows that spatial experiences form a manifold of three dimensions, which may be wholly divergent and simple or wholly reëntrant and compound, or partly one and partly the other.

Direction in space is a heterogeneous relation: that is to say, the direct and converse aspects of a relation of direction differ, and are called "opposite" directions. The relation of direction is also a transitive relation; that is to say, if a spatial experience is in a certain direction from a second, and the second in the same direction from a third, the first also is in the same direction from the third.

A straight line in space is a manifold of spatial experiences characterized by one certain spatial relation of direction. It is thus a one-dimensional manifold.

It proves that a system of three of the one-dimensional manifolds called straight lines, at right angles to one another, or what is called a system of rectangular axes, is necessary and sufficient, among other triple systems, to express the spatial relation of any member of any group of spatial experiences to any other member. Spatial experiences thus appear manifolds of three dimensions.

The question arises, whether these dimensions are divergent and simple, or reëntrant and compound.

To assert that the dimensions of Space are divergent is to assert that no spatial experience will be found to bear to any other both the direct and the converse aspects of the relation in which they subsist. If it is in one direction therefrom, it will not be in the opposite direction. This is to assert that spatial dimension is simple. Given any two spatial experiences, the aspect borne by one to the other is not ambiguous, but unequivocal. Assuming that a spatial experience can always be found beyond any that are found, Space is both endless and externally infinite apart from its continuity.

To assert that the dimensions of Space are reëntrant is to assert that any spatial experience will be found to bear to any other both the direct and the converse aspects of the relation in which they subsist. If it is in any one direction therefrom it is also in the opposite direction. This is to assert that spatial dimension is compound.

Given any two spatial experiences, the aspect borne by one to the other is not unequivocal, but ambiguous. That is to say, in one regard the aspect borne by one to the other is the same as the aspect borne in the other regard by the second to the first. Hence, although a spatial experience may always be found beyond any that are found, Space, while endless, has no infinity apart from its continuity.

It is conceivable that some kinds of spatial experience may exhibit divergent dimension, and other kinds reëntrant dimension.

The spatial experiences composing a ray of light are now conceived to exhibit reëntrant dimension. It is supposed that a ray of light, while continuing to follow one direction, may eventually return into itself. But it may also be that an X-ray or a "Cosmic" ray would not regain its source, however prolonged. The straight line of tradition may be a fact of nature. If so, although the space of light would have no infinity apart from its continuity, the space occupied by these other forms of spatial experience would be infinite without that limitation. Space would consist of more than could be illuminated, even theoretically, by any source of light.

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BOOK REVIEWS

New Realism and Old Reality. D. LUTHER EVANS. Princeton: Princeton University Press. 1928. Pp. viii + 199.

This book is divided into three parts: Part I, New Realism and Science; Part II, New Realism and Philosophy; Part III, New Realism and Religion. The author's general plan is, first, to catalogue the fallacies of which new realism has accused the traditional philosophies, principally the systems known historically as naturalism and idealism; and secondly, to point out that new realists have themselves fallen into these errors. The following is a brief summary of the author's presentation of new realism and of the criticisms which he advances:

I

According to the new realist, traditional philosophies have made the initial and fatal mistake of regarding "logic as the conclusion and fruit of philosophy, whereas it should be considered philosophy's commencement and root" (p. 4). The new realist, on the contrary, proposes to begin with logic and to let it lead him to such a philosophy as it may. The failure of traditional philosophers to do this has tricked them into certain very serious fallacies: The Speculative

Dogma, The Error of Pseudo-Simplicity, and the Fallacy of Exclusive Particularity. To these cardinal sins are added several subsidiary fallacies, all of which illustrate the "system-maker's vanity," that is, the forcible reduction of the many to the one. "The Logic of Traditional Reflection" (cf. Chap. I, Sec. 3) has espoused the doctrine of internal relations, that is, the doctrine that everything in the world is in modifying relations to everything else and that reality is the comprehensive class which includes all predicates. This, in turn, has led the traditional systems to develop the concept of an underlying substance of indefinite potentiality, idealism insisting that this substance is mental, and materialism and naturalism insisting that it is material. Implied in both positions is the mistaken notion that a term can function in only one relationship, that is, that a term can not be both physical and mental (the Fallacy of Exclusive Particularity), which fallacy has been the source of all the traditional attempts at a philosophical synthesis of mind and matter.

The logic of new realism substitutes for the doctrine of internal relations the conception of the externality of relations and for the doctrine of classes the concept of relations, and "repudiates the doctrine that the entities of the world can not exist in relation to each other without being held together by an underlying relater" (p. 9). The principal contention is that relations exist *per se* and that they are independent of the terms related. It is obvious that the only useful logical method for new realism is the method of science, that is, analysis. This is the method advocated and practised by new realism, and it is this method, so the new realist contends, that has saved new realism from the fallacies of which traditional philosophies have been accused.

In Chapter II, the author presents the new realist's interpretation and criticism of the "singularistic" standpoint of those traditional philosophies which have advanced some one single principle in terms of which the whole universe could be explained. Both materialism and positivism (phases of naturalism) "fail to realize that ultimate reality is not physical but logical in character" (pp. 25–26). The result has been that materialism has hypostatized some concept (e.g., matter, or energy) and "thingised" causality, whereas positivism, though more critical, has either "thingised" some concept, or lead to skepticism.

Subjectivism is condemned by new realism, (1) because it starts out with the assumption that epistemology is the basic science, whereas it is merely one science among many, without any final authority, and (2) because it insists that knowing is constitutive of the object. Idealism is thus false from the outset. (The author, here, as at several other points in the text, introduces very sketchy refuta-

tions of these criticisms, but postpones the final evaluation of new realism until later in the book.)

Absolutism is criticized on the grounds that (*a*) it is led by a mystical leaning (pious hopes and fears?) to postulate a concept of a spiritual supporting principle; (*b*) it is formalistic in reducing "will" to logic; (*c*) it equivocates in endowing the Absolute with ethical and theological character after it has once been "logicized;" (*d*) it is guilty of dogmatism in identifying reality with one coherent whole.

Chapter III contains the author's analysis of the new realist theory of the externality of relations. The new realist insists that relations are as real as the terms related and are in fact external to the terms, so that terms can be said to pass in and out of relations. This is true of the knowing relation, so that both existents and subsistents are objective to, and independent of, the knowing mind for their being. The ground on which these contentions are based is the activity of analysis, analysis being defined as careful, systematic, and exhaustive examination of any topic of discourse.

Part II is the author's survey and criticism of new realism's general philosophical position. The basic ontological doctrine of new realism is the doctrine of "neutral entities," that is, entities which have merely pure being, "is-ness," and which are reached by bedrock analysis. These entities are of two kinds, existents and subsistents. The author now turns the tables on new realism and, in his turn, accuses new realism of having committed the fallacies of formalism, equivocation, and dogmatism; formalism, because to consider in ontology everything that can be true or false, real or unreal, as the new realist does, is to have commerce with the inconceivable and the indefinable; equivocation, because the logical ultimates of the new realist are endowed with a positive character which analysis can never reveal as present; dogmatism, because the search for the many is just as much a case of pious aspiration for an ultimate cosmical world ground as any ultimate of traditional philosophy. The author insists that the logical entities of new realism satisfy both of the demands that the traditional concept of substance satisfies, namely, the demand for a self-existent and self-subsistent reality, and the demand for a self-caused and permanent reality, and that thus the new realist is a substantist in spite of his energetic polemic against substantism (p. 104).

In its cosmology, new realism substitutes for the traditional concept of cause the concept of creative synthesis. The author here asserts that those new realists who advance the doctrine of emergent evolution ascribe to the ultimates reached by analysis a character originally denied them, namely, the power to emerge and develop,

and thus not only contradict themselves, but fall into the Error of Indefinite Potentiality, of which they accused the traditional philosophies.

The epistemology of new realism, "neutral monism," asserts the independence of the existence and character of objects of their being known, and also the immanence of the object in the knowing relation, there being no question of an "appearance" being known since there is no mediation, but only a direct and simple relation.

The author now returns to the attack with the formidable weapons originally selected by the new realists themselves, the fallacies of formalism, equivocation, and dogmatism. The new realistic epistemology is guilty of formalism because (1) it fails to provide for the subjective, that is, the qualifying effect of the knower on what is known, especially in the case of affections and connotations; (2) it objectifies error by making it logical, thus making it inevitable, and ultimate skepticism as well; (3) it takes refuge in a third reality which is neutral and has only pure being. The new realist is guilty of equivocation because (1) he endows the neutral entities with generative power, thus doing what the idealist does with dialectic and thus asserting what was denied; (2) by insisting that there is no subject in the knowing relation because he can not find the subject in knowledge he commits the error of exclusive particularity. That the new realist is dogmatic and that he reveals the motive of speculative philosophy is the next charge brought by the author. The following quotation indicates the rather surprising basis for the charge: "The behaviorist, in his espousal of physics as the basis of his psychological interpretations, must assert that every electron-proton change in any particular aggregate redistributes the strains in the universe as a whole. In other words, he must support the internal theory that everything in the world makes a difference to everything else . . . (p. 140).

In Part III, the author surveys and criticizes the religious implications of new realism, reviewing in succession the theology, axiology, and psychology of the new realists. In this part of the book, the author frankly assumes the speculative bias and insists that "values must be interpreted in the light of entities that are more than values, or at least that represent values yet unwon" (p. 149). The author's demand here is that new realism "must meet the emotional claims of sentiment as well as the intellectualistic exactions of science" (p. 150).

In considering the new realist's conception of God, the author is somewhat embarrassed by the lack of loquacity on this subject in the literature of new realism. E. G. Spaulding's statement that "God is the totality of values, both existent and subsistent, and of

those agencies and efficiencies with which these values are identical," is selected by the author as the basis of criticism (p. 155). The author objects to this definition of God because (*a*) God becomes the creation of values rather than the creator, and (*b*) because in new realistic ontology there are too many non-values in the world, thus making God finite. This conception of God leaves the new realist and all other humans little hope for the supremacy of goodness, since God is simply the collection of values in which disvalues are as real as values" (p. 156). Moreover, for G. E. Moore and Bertrand Russell, values exist only for contemplation by a compensating imagination, since values are asserted to be eternal subsistents, intrinsic, and independent of human relationships. What, then, is to become of social service? asks the author. However, even this unsatisfactory doctrine is (by the author) said to be good for the American people because they are shortsighted enough to demand "that a thing must be more than good—it must be good for something" (p. 165).

The new realist's position on the subject of finite personality is unsatisfactory to the author because it is for the most part little more than the acceptance of biological individuality, whereas the "ideal-loving axiologist" wants a self which is "a creating, novelty-making entity," and not one dependent upon conditioning factors, a conception advanced by Spaulding. New realism is commended, in so far as its idea of self-hood justifies belief in the independence of human selves, because this is truly democratic and American.

In the section on "The Progressive Character of Human Nature" (IX, 2), the author examines various definitions of freedom offered by the new realists, all of which he rejects as being unsatisfactory to the "axiologist." Perry, moreover, since he speaks as if he meant to satisfy the "axiologist," but doesn't really do so, is guilty of "the fallacy of verbal suggestion," something of which the new realist has previously accused the idealist.

There follow a summary and final appraisal of new realism. In spite of the running commentary of criticism which has preceded, the author here says that the "shortcomings [of new realism] are slight . . . when certain very significant services of the doctrine for philosophy are considered" (p. 192). First, the doctrine has taught the lesson that philosophy can not be divorced from science; secondly, it has brought the assurance that all in the world is not change and thus restores one's balance in an age when relativity is the keynote; thirdly, it has recognized "the aspects of both the physical and the psychical without dualistically contradicting monism necessary to science" (p. 194).

The "slight" shortcomings are next pointed out: (*a*) "In stressing impersonal objectivity to the extreme, the new realist has been

guilty of logical errors . . ." (p. 192). (*b*) He admits that "the false and the evil are also possessed of veritable being" and thus does not admit "wholeheartedly into his philosophy the idea of a cosmic principle of goodness and truth which will guarantee the victory of the best" (p. 193). (*c*) He has not given "sufficient attention to the features of experience which have traditionally been discussed under the names of ego, soul, personality, and so on" (p. 194). (*d*) "He errs . . . in not bringing the two types of being (things and ideals) together in synthetic union" and he "carries analysis to the point of falsification when he separates mind from matter, values from facts, meaning from existents, universals from particulars" (p. 194).

The author then proceeds to advance his own theory "that the material and the mental are one without the uniqueness of either feature being lost" (p. 194). This reviewer must confess that he was, and still is, considerably mystified by the author's statement of his position, as well as by the name he assigns to it, "Realistic Idealism." This may be in part due to the rather ill-considered brevity of the discussion, only four and a half pages being devoted to the statement of the philosophical position from the point of view of which new realism has been criticized throughout the entire book. The author agrees with Bradley that "reality . . . must be that in which the Absolute as One Experience . . . is positively present" and with A. Seth Pringle-Pattison that "it is the nature of the infinite to express itself in the finite; and the living fact is just this unity—the realization of the infinite and the recognition by the finite of its groundedness in the infinite" (p. 198). The author concludes with the final claim that philosophy, in so far as it represents the tendency of idealism towards objectivity and realism towards subjectivity, is itself "the scene of the dialectic process" and he is led to end his discourse with the triumphant cry, "The speculative dogma, with its ideal of the many in the one, persistently remains."

II

Considerable credit is due the author for collecting the scattered literature of new realism and for attempting a systematic statement of the doctrines of this school. To what extent the new realists themselves will accept this book as a fair and adequate presentation of their position it is not for this reviewer to judge. Some one who can speak officially for this position will have to do this. It must be noted in this connection that the author takes considerable pains to point out the many shades of meaning and the many differences of doctrine current among the new realists.

The author's method and technique, however, are somewhat unsatisfactory. To show that new realism is guilty of the same logical

errors of which it has previously accused idealism and other traditional philosophies is merely to demonstrate that all are tarred with the same brush. This technique is the technique of the sectarian polemic, but not of philosophical criticism. In the Preface the author expresses the hope that "this volume will fill the need for a comprehensive discussion of the meaning and validity of realistic philosophy." In the face of the implied promise, the reader can not but be a bit disappointed that the "comprehensive discussion" is almost entirely in terms of the author's own philosophical predilections. The book is really a criticism of new realism from the standpoint of an idealist, or rather, of the special kind of idealist indicated by the author's name for his own position, "realistic idealism."

The author's frankly confessed bias is evident throughout the book. He insists, for example, that "new realism must meet the emotional claims of sentiment as well as the intellectual exactions of science." If this position is logically sound it may some time be necessary to make room for Santa Claus in our philosophy. In Part III, the author appeals again and again to an unhappily-named individual, "the axiologist," who seems to be a kind of idealistic universal and who is the critic whose "emotional claims of sentiment" must be listened to, and whose opinions—in ethics and theology—are accepted as the final criteria of judgment. "He" insists, for example, that "a pluralistic universe needs a soul as a vitalizing agency," and therefore demands that new realism must provide such an agency. But isn't it a bit unfair to insist that new realism shall both eat its cake and keep it?

Another cause of some confusion in this reader's mind was the tendency of the author—a tendency characteristic of so many writers on philosophy who confess to an idealistic bias—to employ the pious terminology of mediaeval theology without apparently professing the dogmas. For example, it is clear enough that the author believes in the personality of God, but it is not clear that he believes that God is a person.

The reviewer also finds the author's criticism of the doctrines of new realism unsatisfactory for another reason. The concept of relation is certainly a very essential one in new realism; in fact, it might be said to be the heart of this philosophy. The careful analysis and detailed criticism of this concept would therefore seem to be the fundamental task of a student of this school. What is the status of the concept of relation? If "analysis" is the instrument, is the concept of relation discovered by analysis or is it postulated? When the new realist says that both existences and meanings must be known through analysis is he making any epistemological presuppositions, and that in spite of his expressed contempt for episte-

mology? Is "relation" first discovered in thought and then ascribed to reality, or *vice versa?* Does the doctrine of the externality of relations involve the fatal error of hypostasis? These are rather superficial intimations of the questions which trouble those who are anxious to understand and evaluate new realism, and they are questions which the author can not consider satisfactorily by virtually saying to the new realist, "You commit the same errors that the traditional philosophies do and so you are no better than the rest."

Nor is the policy of some new realists to turn their back on the history of philosophy or to dismiss it with a wave of the hand as one long record of the hopeless and misguided efforts of the system-maker very helpful in solving these problems. The traditional questions of philosophy are not solved by being ignored nor by being assigned uncomplimentary names.

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Essays in Philosophy. JAMES WARD. Edited by W. R. Sorley and G. F. Stout, with a Memoir of the Author by Olwen Ward Campbell. Cambridge: The University Press. 1927. vii + 372 pp.

The main body of this work consists of twelve lectures and essays, produced by Professor Ward at intervals over a period of forty-five years. The essays are prefaced by a memoir of their author, about a hundred pages in length, contributed by his younger daughter.

To many, this memoir will prove the most interesting part of the book. It is, in a sense, the record of a dual personality the two parts of which were lived successively. The Ward that is known to the public is the scholar, philosopher, and scientist of his three great books, *Naturalism and Agnosticism, The Realm of Ends,* and *Psychological Principles.* But behind, or perhaps we should say before, this scholarly Ward, there lived a different sort of person who had later vanished so completely that most of his readers could hardly have suspected his existence. The controlling interest of the early period was religon, that of the later period, scientific and philosophical insight.

The earlier Ward lasted some thirty years. He was the son of a Liverpool merchant who was a zealous nonconformist, but whose irresponsibility in business led to repeated failures, much hardship for his large family, and an irregular schooling for his son. After some years of desultory reading at home and of apprenticeship in the office of an architect, Ward entered at the age of twenty a Congregationalist college with a view to preparing himself for the ministry. Already, says his daughter, "we find the youth of nineteen exhorting the boys and girls of the Sunday school to think of the

Judgment, and reflect upon the eternal fires. . . . Working at his office all day, he was either studying, preaching, or helping at clubs and Sunday schools in the evenings." At the college, where he remained for six years, and where his father's failure in business combined with his own failure in health to make his life a continual struggle, he supported himself largely by occasional work in the pulpit, and "shewed signs of becoming a remarkable preacher." He was looked upon by his teachers as one who could later fill with credit the higher positions of his church, was given a scholarship for further study in Germany, and immediately upon his return was offered the pastorate of the Congregational chapel in Cambridge. To all appearances, he was launched upon a career of distinguished religious leadership.

A year later this career was in ruins. The story is a familiar one which has been reenacted hundreds of times. Even before his visit to Germany, the foundations of his Calvinistic faith had shown signs of crumbling, and under the teaching of Dorner, Trendelenburg, and Lotze, the disintegration was so extensive that his year of preaching at Cambridge, in the face of a continually torturing conscience, was, as he said half a century later, the "darkest and saddest" of his life. Resigning his pulpit, he decided at almost thirty to begin life anew.

His first step was to enter Cambridge University as an undergraduate at Trinity College. Here he met the second main intellectual influence of his life. "If I am anything at all," he once said, "I owe it to two men, Hermann Lotze and Henry Sidgwick." Sidgwick was quick to detect the seriousness and ability of his somewhat singular student, and after Ward had given solid proof of his capacity by winning in two years a first class in the moral sciences and a fellowship at Trinity, Sidgwick helped to secure for him the lectureship which he held until 1897. In that year he was elected to the new Cambridge professorship of Mental Philosophy and Logic. Of the last fifty years of Ward's life, his daughter says comparatively little. It was an outwardly uneventful period of continuous and strenuous work, broken only by vacation journeys and by an intensely enjoyed visit to the United States in the summer of 1904. Ward's activities in these years were by no means limited to philosophy. He delivered a series of lectures, recently published, on education, wrote for the *Encyclopædia Britannica* an article on psychology which turned the current of English thought on psychological matters, worked at anatomy in the Leipzig laboratories of Ludwig and the Cambridge laboratories of Sir Michael Foster (who, indeed, described him as "a physiologist spoiled"), explored the great range of physical literature which forms the background of *Naturalism and Agnosticism,* and, in company with his friends,

Oscar Browning, J. G. Frazer, and others, read indefatigably in English, Latin, and Italian literature, and investigated new territory in botany, music, and mathematics. A dangerous operation in 1910, which he rather expected to prove fatal, gave him on the contrary new strength and energy, and the present writer remembers how, at nearly eighty, Ward was still eagerly discussing new developments in philosophy, writing a presidential address for the Aristotelian society, and collecting criticisms on his Gifford lectures for reply, with his British Academy lecture and his volume on Kant still well in the future. His life seems to have grown happier as it grew longer until its sudden close in 1925.

Both the older and the younger Ward are represented in these essays. The first and last of the series are concerned with religious faith, the others with the philosophic and scientific interests of his maturer years.

The first essay, which is by far the earliest, is also the most unsatisfactory. He is concerned with justifying faith, which he insists is not "the intellectual acceptance of a creed," but "personal trust and confidence in an Unseen Being." In order to avoid the necessity of producing grounds for such faith, he seems to deny, without reasons, that it contains intellectual elements, and then proceeds, nevertheless, to give a series of inadequate grounds for what was to need no grounds at all. For example, he appears to accept the old analogical argument that the universe is tenanted by a spirit just as man is. Here he clearly takes faith as involving belief. But immediately afterward he argues that faith is justified by its fruits in action, implying, since he was no pragmatist, that faith is not belief, but a set of practical ideals. Nor is the later essay on "Faith and Eternal Life" much more convincing. He has here arrived at a view somewhat similar to Dean Inge's. Faith is now the immediate apprehension of the eternal (i.e., timeless) values of goodness, beauty, and truth, together with a mystical apprehension of a Divine Person who enjoys them. But of neither type of apprehension is any analysis given, and we come away from the essay with the uncomfortable feeling produced by so many such essays, that the faith which was to be analyzed, prompted by a dimly felt fear, has merely locked the analysis out.

In the remainder of the essays, Ward's thought is more unhampered. Essay II, on "The Progress of Philosophy," raises the question whether its title is justified, and argues very convincingly that it is. But the progress, Ward contends, would be much accelerated if some agreement could be arrived at as to what is established and what is not, and if there were any recognized code of symbols. "In science, when a truth is made out it is definitely formulated, and receives a name; there is Snell's Law, Boyle's

Law, Avogadro's Law, Ballot's Law, and so forth. But in the whole region of philosophy, with the partial exception of Logic, there seem to be no rights and no rule. Philosophy has no nomenclature and no terminology. Every giant and every pigmy states and misstates and restates much as he wills: even babes and sucklings rush abroad brandishing the Infinite and the Absolute with infinite ignorance and absolute conceit. If there is anything fixable, why do we not fix it?" In the following essay on "The Difficulties of Philosophy," this predicament figures again as a chief example of his subject.

Essay IV, on "The Present Trend of Speculation," shows how much water has flowed under philosophic bridges since it was written in 1903. The thought of the time, says Ward, tends toward idealism, the primacy of the will (exemplified in pragmatism), acceptance of the historical method, as shown in evolutionism, pluralism as opposed to absolutism, meliorism rather than quietism in religion. In the fifth essay, "Philosophical Orientation," and in the Sidgwick Memorial Lecture on "Heredity and Memory," which stands as Essay VIII, some of his own theories come to the fore. Mind, he insists, is neither a cog in a physical mechanism, nor is it a stream of consciousness; it is a substantial but spiritual entity in interaction with the body. And it plays a much larger part in the moulding of the body than is commonly supposed. Ward carefully reviews the evidence on the inheritance of acquired characters, concludes that it does not condemn such inheritance, and then proceeds to argue that what are called inherited instincts are really racial habits, acquired not by chance variation and natural selection, but by a long course of trial and error. It is an essay full of unorthodoxy and of speculative courage.

So also, though in less degree, are the pair of essays that follow. The first of these, "In the Beginning . . .," is largely an attack on absolute idealism for taking as its "beginning," that is, as its touchstone of truth and reality, an absolute experience rather than nearer and more certain truths like the existence of the individual self. But there is some misconception here; the Absolute is not itself conceived as the touchstone, but rather the law of contradiction, and it would be difficult to find a safer "beginning" than this. In the paper on "Einstein and Epistemology," Ward considers Professor Eddington's conclusion that "all the more familiar terms of physics . . . denote not objective characters, but relations to some observer or his idealized equivalent," and protests that such statements do not explain, they explain away; they dissolve the content of experience into its form, and leave us in the end with relations relating nothing.

On looking back over Professor Ward's work from the stand-

point of his final volume, one is left with the feeling that his chief books, like his own philosophic beginnings, were unfortunate in coming too late. If his Gifford lectures had appeared twenty years earlier, when the struggle over naturalism was at its height, their influence would have been vastly greater; if his *Psychological Principles,* which, in the press of other work, was postponed more than thirty years, had appeared in the 1880's, its effect would have been enormous. The physics, which he so elaborately criticized, has already shifted its basis, and his work on psychology was given to a public which, mistakenly as I think, believed it had grown beyond his standpoint. The first impulse of his reader is no longer, as it was for Professor A. E. Taylor, "simply to thank God that we have such a philosopher as Dr. Ward." But granting all this, there is so much original and acute analysis in the three books that have made his name, and so remarkably rich a background of scientific and historical knowledge, that one can not believe philosophical readers will willingly let them die.

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NOTES AND NEWS

To the Editors of the Journal of Philosophy:

Mr. Max Eastman's two page letter (this Journal, Vol. XXV, pp. 475–6) in answer to a footnote in my article on "The Philosophy of Dialectical Materialism" came to my notice today. The footnote in question was in the way of an aside, since the article was not concerned with Mr. Eastman's *Marx, Lenin, and the Science of Revolution.* I have reviewed Mr. Eastman's book at length in the *Modern Quarterly,* Spring issue, 1928, and those who are interested in discovering whether or not I have been guilty of a "literary slander" against Mr. Eastman are referred to the detailed criticisms contained therein. Chapter and verse are cited. The review in the *Modern Quarterly,* although published later, was written *before* the article on "The Philosophy of Dialectical Materialism." It was composed after an exchange of letters between Mr. Eastman and myself in which Mr. Eastman refused to meet any of my criticisms to his book, but contented himself by psychoanalyzing me instead. Mr. Eastman is convinced that the source of my opposition to, and alleged misrepresentation of, his views lies in the fact that he has stolen by thunder, since I had been preparing to write on "Marxism as a Judgment of Practice." Mr. Eastman's logic here is difficult

to fathom, since his book attempts to show that that is precisely what Marxism is *not*.

Mr. Eastman complains that I have borrowed an argument from him without acknowledgment. Had he quoted the two passages in question (pp. 150–1 of this JOURNAL, Vol. XXV, and pp. 50–1 of his book) he would not, I think, venture the accusation. My criticism of the "orthodox Marxian" conception of history was that it failed to distinguish between necessary and sufficient conditions. It was aimed primarily at Boudin's defence of Marx, as he understands him, against revisionist critics. Now most valid criticism of *monistic* conceptions of history hinge around this distinction between necessary and sufficient and there is hardly a book on historical materialism which does not charge the Marxians with confusing cause and condition. The critics, however, do not usually attempt to explain the difference. What I was primarily interested in was in stating the difficulties in *logical* terms—in precisely the manner which Mr. Eastman regards as academic (in a disparaging sense)—*and in showing that the Marxians are speared on the same logic which they use against other monistic conceptions of history.* I do not claim to have discovered the argument—it is as old as the revisionist movement and was always in the air, so to speak. No one can trace its paternity. But Mr. Eastman's belief that since he has offered an illustration of the argument he has also discovered the structure of the argument, is significant as an illustration of his logic. If absolute novelty is the sign of originality, then I am prepared to show that not a single argument in Mr. Eastman's book is original. In this connection I may also add that in the *Modern Quarterly* review I *do* credit Mr. Eastman with using this argument, maintaining, however, that he does not press it far enough. Mr. Eastman, therefore, can not honestly believe that I tried to cover up any possible indebtedness to him by crass misrepresentation. So far as I am aware, I am only indebted to Mr. Eastman for stating views which I do not believe.

Mr. Eastman's letter did not make the nature of my criticisms of his book clear. I shall state them here baldly and refer to the articles in the *Modern Quarterly,* Spring, 1928, and the *Open Court,* February, 1928, in which they are developed.

I have maintained (1) that Mr. Eastman does not understand Marx, (2) that Mr. Eastman does not understand instrumentalism, from which point of view he presumes to pass criticism on Marx, and (3) that Mr. Eastman's attempt to interpret Marx's doctrines as "social psychoanalysis" involves bad psychology and worse logic.

SIDNEY HOOK.

BERLIN.